ICHTHYOLOGICAL RESULTS OF CRUISE MD-42/SIBEX-II. PART 1. FISHES FROM RMT-8 STATIONS, WITH ADDITIONAL RECORDS OF LANTERNFISHES (MYCTOPHIDAE : OSTEICHTHYES) FROM THE INDIAN AND ATLANTIC SECTORS OF THE SOUTHERN OCEAN

by

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ABSTRACT.- The taxonomic composition of the fishes obtained from mesopelagic RMT-8 hauls, which were deployed during cruise MD-42/SIBEX-II of R.V. Marion Dufresne, and of lanternfishes sampled by French research vessels and commercial trawlers operating in the western Indian and eastern Atlantic sectors of the Southern Ocean, is reported. ***Protomyctophum (Protomyctophum) choriodon*** (fam. Myctophidae) and ***Benthalbella macropinna*** (fam. Scopelarchidae) represent new records for the Indian sector of the Southern Ocean. There is no evidence of zonal distribution patterning in species found south of the Antarctic Polar Front, although a northerly spread of epipelagic East Wind Drift species may occur between 65° E and 75° E, in association with northerly transport in this region. Myctophid species assemblages are similar in the Indian and Atlantic sectors of the Southern Ocean, with no indication of population structuring within the two sectors. Analysis of lanternfishes from the stomach contents confirms the vertical migratory feeding behaviour of *Champsocephalus gunnari* and suggests predation confined to the epibenthic layer for *Dissostichus eleginoides*.

RÉSUMÉ.- La composition taxinomique des poissons récoltés à l'aide du chalut mésopélagique RMT-8, utilisé au cours de la campagne océanographique MD-42/SIBEX- II du Marion-Dufresne, ainsi que celle des myctophidés échantillonés par ce même navire et des chalutiers opérant dans le secteur indien occidental et atlantique oriental de l'océan Austral sont presentées. ***Protomyctophum (Protomyctophum) choriodon*** (fam. Myctophidae) et ***Benthalbella macropinna*** (fam. Scopelarchidae) représentent des nouvelles signalisations pour le secteur indien de l'océan Austral. Aucun type de distribution zonale n'est mis en évidence pour les espèces trouvées au sud du Front Polaire Antarctique même si une dispersion vers le Nord des espèces épipélagiques de la Dérive des Vents d'Est peut se rencontrer entre 65° Est et 75° Est, en association avec un transport vers le Nord dans cette région. Les assemblages d'espèces de Myctophidés sont identiques dans les secteurs indien et atlantique de l'océan Austral, sans indice de structurations des populations à l'intérieur des deux secteurs. L'analyse des Myctophidés provenant des contenus stomacaux d'autres poissons confirme, chez *Champsocephalus gunnari*, la tendance à réaliser des migrations trophiques verticales, et suggère, pour ***Dissostichus eleginoides***, une prédation limitée au niveau épibenthique.

Key words : Myctophidae, Scopelarchidae, PS, Antarctic Ocean, Station lists, Cruises.

During cruise MD-42/SIBEX-II from 12 January to 6 February 1985, the R. V. Marion-Dufresne occupied stations on the Kerguelen-Gaussberg Ridge, at the entrance to Prydz Bay and in the Indian sector of the Southern Ocean. Ichthyological research activities focused on the distribution, abundance, biology and karyology of benthic and mesopelagic species. A series of oblique hauls were made with a Rectangular Midwater Trawl (RMT-8), some of which were devoted particularly to fishes, some to

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"qualitative" krill studies (broad-scale krill distribution, biochemistry and biology) and some to "quantitative" krill studies (krill abundance estimates).

This paper reports on the fishes collected during the RMT-8 operations, in an attempt to examine species composition and distribution within the region, both oceanically and above the ridge system. Further, and for lanternfishes (Myctophidae), aspects of the biology and population structure of species from the Indian sector of the Southern Ocean are compared with similar data sets derived from Atlantic sector specimens, in order to examine the circumpolar distribution patterns, which are prevalent in Antarctic and Subantarctic species.

Lanternfish specimens obtained during MD-42/SIBEX-II and at stations occupied with a beam trawl are included for completeness. Myctophid specimens from previous French research cruises in the eastern Atlantic and western Indian sectors of the Southern Ocean, and incidental material from commercial trawlers operating around Kerguelen Island, have also been incorporated in this study. This material includes samples from the stomachs of *Champsocephalus gunnari* and *Dissostichus eleginoides* and data on the lanternfishes collected in February 1981 during the FIBEX-cruise (MD-25) of the R.V. Marion-Dufresne. Where pertinent, the discussion also encompasses unpublished data derived from SIBEX-II specimens collected by the R.V. Africana in February-March 1986, and data from FIBEX stations (January-March 1981) occupied by the M.V. Nella Dan (Williams *et al.*, 1983).

MATERIAL AND METHODS

Sixty-one oblique hauls were made with a non-closing RMT-8 sampler (Baker *et al.*, 1973) during cruise MD-42/SIBEX-II : 31 hauls were devoted particularly to fishes ; 16 hauls to qualitative krill studies ; and 14 hauls to quantitative krill studies. Details for these hauls are given in Tables I and II and their geographic positions are indicated in Figure 1. The fishing depth of the RMT-8 net was recorded at 14 stations with the aid of a bathykymograph (Tsurumi Ltd, Japan). Fishing depths at all other stations have been calculated from the regression of metres-of-wire-out against fishing depth for these 14 stations and from 23 stations occupied during cruise MD-50/*Jasus* (3 July-1 August 1986) of the R.V. Marion Dufresne with the same gear and at similar towing speeds (1,5-3,0 kn), but monitored with a Time-Depth-Recorder (Benthos Inc., USA) ; the maximum fishing depths for these stations are presented as the 95 per cent confidence limits of the regression. Station data for the additional material are given in Table III. Details of beam trawl stations, which were occupied during MD-42/SIBEX-II, have been presented by Duhamel (1987).

For lanternfishes, the methods for taking measurements and counts follow Nafpaktitis (1973), the photophore groupings and their abbreviations are in accordance with Paxton (1972) and Hulley (1981, 1986b), and sexual maturity in females is assessed according to Hulley (1984).

Larval specimens of certain benthic and epibenthic species have been identified only to family level. Further, species identifications for the genus *Cyclothone* (family Gonostomatidae) have not been attempted.

The strategy for analysing biological survey data employed by Hulley and Krefft (1982) was used. Stations were grouped using the Bray-Curtis similarity measure and both group-average sorting and multi-dimensional scaling (MDS) ordination of standardized (number of specimens/30 minutes at trawling depth), root-root transformed data. Due to high inter-station variability in sampling procedure (fishing depth, bottom depth, time at fishing depth, time of day), particularly over the ridge and during those hauls directed at krill, only those data from the RMT-8 ichthyological stations of the southern grid system (Station 17-050 through 34-118)

Table I : Cruise MD-42 (SIBEX-II). Station Data : RMT-8 (Ichthyology). FDEPTH : fishing depth; BDEPTH : bottom depth ; m.w.o. : metres of wire out ; LMT : local mean time ; 95 % CL : 95 per cent confidence limit.

STAT NO	PREL NO	LATITUDE	LONGITUDE	DATE	TIME AT DEPTH (LMT)	FDEPTH (mwo)	FDEPTH (m)	FDEPTH (m) 95% CL	BDEPTH (m)
01	003	51°16.17'S	71°31.73'E	12.01.1985	0445-0518	500		325-356	750- 990
01	006	51°03.30'S	71°54.32'E	12.01.1985	1350-1420	300		199-239	500- 680
02	007	52°47.53'S	72°20.61'E	13.01.1985	0225-0255	220		148-194	450- 585
03	016	52°39.58'S	74°47.11'E	14.01.1985	0130-0200	315	250		275- 320
03	019	52°40.21'S	74°54.86'E	14.01.1985	0722-0752	442	325		510
04	022	53°12.06'S	74°08.76'E	14.01.1985	1541-1611	414	330		400- 600
05	028	53°20.27'S	73°18.57'E	15.01.1985	0216-0246	414	360		470- 500
06	033	54°28.62'S	74°04.29'E	15.01.1985	1657-1917	656		417-452	1 500
10	034	58°35.30'S	77°20.45'E	18.01.1985	0522-0552	420	280		780- 800
11	038	59°19.20'S	76°59.27'E	18.01.1985	2045-2116	451	285		1 150-1 160
12	039	58°55.98'S	77°45.65'E	19.01.1985	0058-0128	480	308		800-1 130
13	043	59°20.43'S	81°42.98'E	19.01.1985	1933-2003	1 117		676-750	1 765-1 800
15	044	59°21.20'S	79°51.35'E	21.01.1985	0319-0349	1 118		677-751	2 080-2 120
16	048	60°46.21'S	79°54.73'E	22.01.1985	0309-0310	238	222		2 550
17	050	62°18.85'S	79°55.67'E	22.01.1985	1907-1937	468	235		2 520-2 600
18	052	63°47.69'S	79°54.05'E	23.01.1985	1604-1634	1 250		750-837	3 700-3 710
19	054	65°04.09'S	80°08.49'E	24.01.1985	1044-1114	750	495		3 500
20	056	65°47.27'S	79°00.84'E	24.01.1985	2014-2044	750	470		3 210
21	059	66°08.63'S	77°05.36'E	25.01.1985	0840-0910	1 045		637-703	2 890-2 940
22	062	66°33.49'S	74°43.84'E	25.01.1985	2236-2306	1 250		750-837	2 350-2 470
22'	069	67°00.35'S	73°44.79'E	26.01.1985	1109-1139	492	360		470
22'	078	66°34.85'S	72°26.65'E	27.01.1985	0210-0310	1 500		888-1002	875-1 200
23A	084	63°59.46'S	70°43.59'E	28.01.1985	1931-2001	1 200		722-804	3 460
26	091	62°59.36'S	77°29.68'E	30.01.1985	2038-2100	1 200		722-804	-
27	096	63°03.83'S	73°07.28'E	31.01.1985	1833-1903	1 250		750-837	3 940
28	098	63°01.37'S	68°17.95'E	02.02.1985	1911-1941	1 200		722-804	4 200
29	104	61°59.91'S	68°33.99'E	03.02.1985	1828-1858	1 200		722-804	4 290
30A	107	62°01.01'S	75°04.28'E	04.02.1985	1924-1954	1 200		722-804	3 960-4 010
32	111	60°57.99'S	77°33.43'E	05.02.1985	1950-2020	1 200		722-804	3 660
33	117	61°03.23'S	73°19.05'E	05.02.1985	1829-1859	1 200		722-804	3 570-3 885
34	118	61°01.82'S	68°19.07'E	07.01.1985	2312-2342	1 200		722-804	3 990-4 000

Table II : Cruise MD-42 (SIBEX-II). Station Data : RMT-8 (Krill) (See Table I for abbreviations).
* - prediction outside range.

STAT NO	PREL NO	LATITUDE	LONGITUDE	DATE	TIME AT DEPTH (LMT)	FDEPTH (mwo)	FDEPTH (m)	FDEPTH (m) 95% CL	BDEPTH (m)
21	060	66°09.36'S	77°01.35'E	25.01.1985	0947-0948	372		245-281	2 890
22	063	66°36.03'S	74°42.18'E	26.01.1985	2351-0006	125	100		2 320
22	064	66°37.03'S	74°40.67'E	26.01.1985	0028-0030	374	154		2 320-2 325
22C	080	65°18.06'S	70°19.03'E	27.01.1985	1602-1604	75		*	3 060
23	082	63°59.07'S	68°18.09'E	28.01.1985	1017-1022	80		*	3 400
23	083	63°58.79'S	68°22.76'E	28.01.1985	1057-1058	238		160-204	3 400
23A	085	63°59.54'S	70°50.76'E	28.01.1985	2051-2056	70		*	3 487
23A	086	63°59.55'S	70°55.18'E	28.01.1985	2142-2143	276		184-226	3 485
23B	087	64°01.14'S	72°17.41'E	29.01.1985	0612-0622	102		*	3 660
25	088	63°58.30'S	77°33.37'E	30.01.1985	1117-1127	72		*	3 600
25	089	63°58.30'S	77°35.22'E	30.01.1985	1154-1205	90		*	3 600
25	090	63°58.33'S	77°39.85'E	30.01.1985	1222-1223	246		165-209	3 600
26	092	62°58.47'S	77°36.24'E	30.01.1985	2153-2203	72		*	-
26	093	62°58.17'S	77°38.61'E	30.01.1985	2232-2233	258		173-216	-
27	094	63°00.23'S	73°09.78'E	31.01.1985	1708-1718	72		*	3 940
27	095	63°01.50'S	73°08.13'E	31.01.1985	1754-1755	258		173-216	3 940
28	099	63°00.96'S	68°13.07'E	02.02.1985	2022-2032	72		*	4 200
28	100	63°04.45'S	68°09.69'E	02.02.1985	2107-2108	252		169-212	4 160
29	102	62°00.00'S	68°23.92'E	02.02.1985	1705-1720	72		*	4 290
29	103	62°00.10'S	68°27.05'E	02.02.1985	1752-1753	252		169-212	4 290
30	105	61°59.40'S	73°11.10'E	03.02.1985	1229-1244	96		*	4 065
30	106	61°58.51'S	73°15.42'E	03.02.1985	1317-1319	258		173-216	4 050
31	108	62°01.00'S	77°29.30'E	04.02.1985	0800-0810	96		*	3 500
31	109	62°00.01'S	77°36.55'E	04.02.1985	0843-0845	262		175-218	3 490
32	110	60°57.60'S	77°31.96'E	04.02.1985	1852-1902	72		*	3 660
32	112	60°54.52'S	77°37.05'E	05.02.1985	2107-2108	262		175-219	3 615
32	113	60°53.68'S	77°38.15'E	05.02.1985	2129-2139	72		*	3 600
33	115	61°00.72'S	73°11.76'E	05.02.1985	1649-1659	72		*	3 585-3 735
33	116	61°01.44'S	73°14.94'E	05.02.1985	1733-1735	264		176-219	3 670-3 695
34	119	61°04.48'S	68°16.46'E	07.02.1985	0036-0037	264		176-219	4 000

were analysed in this manner. Station 16-048 was run to simplify the launching procedure of the net (one minute at 238 m.w.o. fishing depth) ; data from this

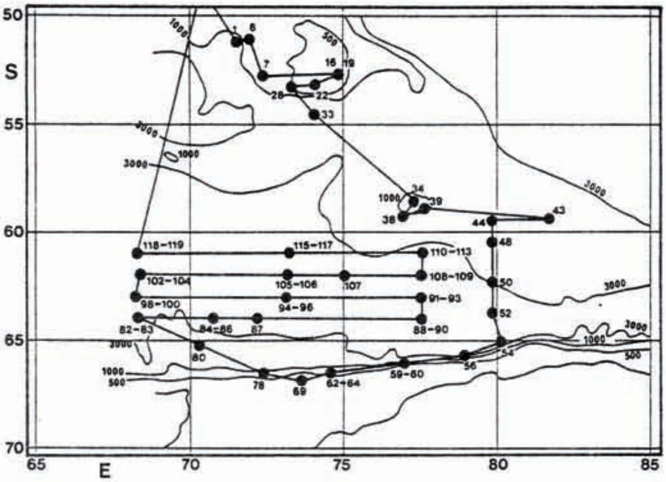


Fig. 1 : RMT-8 stations occupied during cruise MD-42/SIBEX-II in the Indian Sector of the Southern Ocean. Figures refer to the sample Number.

Table III : Station Data : Additional Material. STAT NO : Station number ; PREL NO : prelevement number ; LMT : local mean time ; FDEPTH : fishing depth ; IKMT : 10 ' Isaacs - Kidd Midwater Trawl. * : stomach contents of *Dissostichus eleginoides* ; + : stomach contents of *Champsocephalus gunnari*.

CRUISE/TRAWLER	STAT NO	PREL NO	LATITUDE	LONGITUDE	DATE	LMT	GEAR	FDEPTH (m)
MD-03	1	1	49°29.4'S	75°58.7'E	02.04.1974	0730-0830	IKMT	-
MD-03	3	8	49°32.2'S	71°54.3'E	05.04.1974	0147-0240	IKMT	-
MD-03	11	31	53°20 'S	72°29 'E	09.04.1974	1510-1550	Beam	790
MD-03	12	34	55°55.9'S	69°50.0'E	10.04.1974	1223-1554	Sanders	4170
MD-03	13	41	50°56.8'S	65°42.5'E	12.04.1974	1712-1745	Sanders	3250
MD-03	13	42	50°49.1'S	65°39.9'E	12.04.1974	2214-2322	Beam	3240
MD-03	17	50	47°24.9'S	66°04.0'E	14.04.1974	1930-2030	Blake	585
MD-04	106	258	48°43.5'S	71°06.5'E	13.05.1975	-	Beam	937
MD-08	69	276	46°46.4'S	50°33.2'E	19.04.1976	0328-0645	IKMT	1600
MD-24	7	12	54°38.4'S	03°19.3'E	20.08.1980	0909-0950	Beam	999
MD-24	8	13	54°31.7'S	03°21.5'E	20.08.1980	1247-1332	Otter	700
MD-24	35	51	53°13.2'S	44°39.3'E	02.09.1980	1955-2044	Beam	585
MD-25	3	17	63°33 'S	30°06 'E	14.02.1981	0328-0357	RMT-8	120
MD-25	5	21	63°56 'S	34°13 'E	15.02.1981	0322-0349	FLH	225
MD-25	5	22	63°56 'S	34°13 'E	15.02.1981	0400-0420	Omori	100
MD-25	5	23	63°55 'S	34°15 'E	15.02.1981	0428-0451	RMT-8	210-175
MD-25	7	34	64°00.5'S	39°38.1'E	16.02.1981	0343-0408	RMT-8	130
MD-25	9	44	63°58.2'S	44°51.5'E	17.02.1981	0315-0337	Omori	130
MD-25	9	45	63°56 'S	44°53 'E	17.02.1981	0345-0414	RMT-8	75-50
MD-25	12	60	63°00 'S	49°12 'E	18.02.1981	1550-1606	Omori	75
MD-25	13	66	63°00.0'S	46°36.8'E	19.02.1981	0305-0340	RMT-8	40-50
MD-25	15	75	63°00.1'S	42°29.2'E	20.02.1981	0407-0440	RMT-8	80-150
MD-25	19	91	63°01 'S	32°34 'E	22.02.1981	0258-0315	RMT-8	15
MD-25	23	110	61°53.1'S	37°17.3'E	24.02.1981	0245-0312	FLH	190
MD-25	23	111	61°53.1'S	37°17.3'E	24.02.1981	0317-0334	Omori	15
MD-25	23	112	61°53.1'S	37°17.3'E	24.02.1981	0337-0400	RMT-8	30
MD-30	42	128	46°22.8'S	49°09.5'E	15.02.1982	2155-2221	Beam	1020
MD-30	52	174	45°48 'S	49°45 'E	18.02.1982	1407-1505	Beam	335
MD-30	54	180	45°43.5'S	49°20.4'E	18.02.1982	2110-2203	Beam	1010
Oceano/Austral/83	8	Bongo	48°41 'S	71°01 'E	17.06.1983	2303-2318	Bongo	0-240
Oceano/Austral/83	15		46°24 'S	51°58 'E	26.05.1983	1020-1117	BT	325
Oceano/Austral/83	35		49°45 'S	70°51 'E	01.06.1983	1100-1235	BT	450
Oceano/Austral/83	80		49°51 'S	70°48 'E	07.06.1983	1120-1225	BT	510 *
Oceano/Austral/83	91		48°06 'S	71°13 'E	09.06.1983	1520-1700	BT	350 *
Oceano/Austral/83	102		48°43 'S	70°58 'E	12.06.1983	0630-0755	BT	260 *
Oceano/Austral/83	112		48°44 'S	70°57 'E	14.06.1983	0605-0750	BT	260 *
Oceano/Austral/83	117		48°38 'S	70°58 'E	15.06.1983	0700-0855	BT	220 +
Oceano/Austral/83	121		48°38 'S	70°59 'E	15.06.1983	1745-2020	BT	270
			Crozet Archipelago Possession Is Baie du Marin		1971/1972	-	-	-
"ALSU"	250		48°51 'S	70°56 'E	01.03.1984	1020-1300	BT	240 +
"AUSTRAL"	20		48°46 'S	70°54 'E	25.03.1984	1525-1730	BT	200 +
"GEROI ADJIMUSHKAYA"	296		48°38 'S	70°57 'E	29.01.1984	1010-1115	BT	215 +
"MYS OSTROVSKOGO"	191		50°19 'S	69°52 'E	19.08.1984	0745-0830	BT	370
"POLTAVA"	512		49°20 'S	66°55 'E	25.03.1985	0710-0900	BT	440 *
"VZMORIE"	104		49°19 'S	66°56 'E	06.11.1984	1310-1510	BT	400

station were not included in the analyses. Furthermore, postlarval specimens identified only as *Electrona* sp. were not incorporated into the data matrix.

RESULTS

The species composition of the catches from all RMT-8 stations is given in Annexe I, which also includes additional data on mesopelagic species from other gears deployed, and on the Myctophidae from previous French research sampling in the eastern Atlantic and western Indian sectors of the Southern Ocean, and from commercial trawlers operating in the environs of Kerguelen.

Table IV : Meristics of Myctophidae from the Indian Sector of the Southern Ocean. (*=damaged).

	Dorsal	Anal	Pectoral	AO	GR	n
Electrona antarctica	13-15	20-22	11-14	16-19	3- 5 + 1 + 11-14	329
Electrona carlsbergi	14	19	12-13	14-15	9 + 1 + 21-22	4
Electrona paucirastra	13	19	13	14	6 + 1 + 15	1
Electrona subaspera	14	21	15	16	7- 8 + 1 + 18	4
Gymnoscopelus bolini	22	22	13	* + *	6 + 1 + 15	1
Gymnoscopelus braueri	15-17	18	*	9 + 9	6- 8 + 1 + 15-16	34
Gymnoscopelus nicholsi	17-18	20	13	9-10 + 7	10-11 + 1 + 21-23	81
Gymnoscopelus opisthopterus	17-18	16-18	11-12	* + *	8 + 1 + 17	52
Gymnoscopelus fraseri	18	18	14	10 + *	8 + 1 + 17	1
Gymnoscopelus piabilis	*	*	*	* + *	10 + 1 + 21-22	10
Krefftichthys anderssoni	12-13	17-20	15	12-13	6- 8 + 1 + 17-21	43
Lampanyctus achirus	*	*	*	*	5 + 1 + 11	1
Metelectrona ventralis	13-14	19	15	15-16	6- 7 + 1 + 16-18	13
Protomyctophum andriashevi	13	23	15-17	*	4 + 1 + 14	3
Protomyctophum bolini	12-13	24-25	15-16	17-18	5- 6 + 1 + 15-17	30
Protomyctophum choriodon	12	23	15	15	6 + 1 + 19	2
Protomyctophum luciferum	13	23-24	15	15	6 + 1 + 18	2
Protomyctophum normani	*	*	*	*	6 + 1 + 18	1
Protomyctophum tenisoni	12	24	15	18	5 + 1 + 17	2

Table V : Gill raker counts of specimens from the Atlantic and Indian sectors of the Southern Ocean.

	NUMBER OF SPECIMENS FOR EACH GILL RAKER COUNT													
	GR_u			GR_l					GR_T					
Gymnoscopelus braueri	6	7	8	14	15	16	17		21	22	23	24	25	
Indian Sector	28	5	1		22	12				20	10	3	1	
Atlantic Sector	135	17		3	75	69	5		3	73	60	14	2	
Electrona antarctica	3	4	5	11	12	13	14	15	16	17	18	19	20	
Indian Sector	3	310	16	12	183	126	8		15	177	118	15	4	
Atlantic Sector	3	84	14	7	35	53	5	1	10	32	44	10	5	
Krefftichthys anderssoni	6	7	8	17	18	19	20	21	25	26	27	28	29	30
Indian Sector	11	26	6	1	9	17	10	6	6	10	11	8	4	4
Atlantic Sector	14	68	9		6	42	35	8	3	11	35	30	11	1
Protomyctophum bolini	4	5	6	14	15	16	17		19	20	21	22	23	24
Indian Sector		29	1		9	19	2				9	19	1	1
Atlantic Sector	13	207	5	5	132	85	3		3	12	121	82	7	

Meristics for the Indian sector lanternfishes are given in Table IV, while gill raker counts of specimens of *Gymnoscopelus (Gymnoscopelus) braueri, Electrona antarctica, Krefftichthys anderssoni and Protomyctophum (Protomyctophum) bolini* from the Indian sector and from the Atlantic sector are given in Table V. Tables VI through IX include the size distribution (standard length) of female specimens of these species with their stages of sexual maturity.

Material from the southern (ichthyological) grid stations resulted in an 18 species by 17 stations matrix. The dendrogram and MDS ordination of the station affinities, based on standardized, root-root transformed abundances of these species are given in Figures 6 and 7 respectively. The broken line drawn at the arbitrary similarity level of 20 per cent delineates two groups of stations : Group I - a single station (Station 22' - 069) ; and Group II - the remainder of the stations of the grid. The broken line at the 40 per cent arbitrary similarity level delimits two subgroups of stations within Group II : Subgroup A - a single station (Station 17 - 050) ; and Subgroup B - the remainder of the stations. The ordination of the similarity matrix using MDS (Fig. 7) gives the same groupings as the dendrogram (Fig. 6).

DISCUSSION

No new species were encountered in the material examined for this paper. Two species, ***Protomyctophum*** **(*Protomyctophum*)** ***choriodon*** and ***Benthalbella macropinna***, represent new records for the Indian sector of the Southern Ocean, socompleting the circumpolar distribution patterns which have been proposed in the literature (Johnson, 1974 ; Hulley, 1981 ; Hulley, in press). Bekker (1985) has recently reported the occurrence of *Electrona carlsbergi* (45° 10'S-69° 12' E; 45° 55'S-69° 07' E), *Protomyctophum (Protomyctophum) andriashevi* (45° 55'S-69° 07' E) and *Electrona paucirastra, Protomyctophum (Protomyctophum) luciferum* and *Protomyctophum (Protomyctophum) normani* (45°10'S-69° 12'E), while both larvae

Table VI : *Electrona antarctica* : Females - distribution of stage of sexual maturity with standard length in Indian Sector specimens (RMT-8 : January 1985 - february 1985.)

	SIZE CLASS (mm)															
	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	TOTAL
STAGE I	4	11	9	3	1	6	0	0	0	0	0	0	0	0		34
STAGE II	0	0	0	2	1	9	8	14	15	10	13	5	0	0		77
STAGE III	0	0	0	0	0	0	0	0	1	0	7	3	1	0		12
STAGE IV	0	0	0	0	0	0	0	0	0	0	2	1	2	0		5
STAGE V	0	0	0	0	0	0	0	0	0	0	2	1	2	1		6
TOTAL	4	11	9	5	2	15	8	14	16	10	24	10	5	1		134

Table VII : *Gymnoscopelus (Gymnoscopelus) braueri* : Females - distribution of stage of sexual maturity with standard length in Indian Sector specimens (RMT-8 : January February-1985). Figures in parentheses refer to specimens from the Atlantic Sector (MT-1600 : November 1975-January 1976).

	SIZE CLASS (mm)																	
	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	TOTAL
STAGE I	0 (0)	3 (0)	3 (2)	2 (1)	5 (5)	3 (1)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		17 (9)
STAGE II	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (2)	3 (5)	1 (12)	1 (15)	0 (20)	0 (10)	2 (9)	0 (2)	0 (0)		7 (75)
STAGE III	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (2)	0 (2)	0 (3)	0 (1)		0 (8)
TOTAL	0 (0)	3 (0)	3 (2)	2 (1)	5 (5)	3 (1)	1 (0)	0 (2)	3 (5)	1 (12)	1 (15)	0 (20)	0 (12)	2 (11)	0 (5)	0 (1)		24 (92)

and adult specimens of *Benthalbella elongata* are known from the Indian sector east of 85°E (Johnson, 1974 ; Johnson, 1982).

The following lanternfish species were recorded from stomach contents of *Champsocephalus gunnari* : *Electrona paucirastra, E. subaspera, Metelectrona ventralis, Protomyctophum andriashevi, P. choriodon, P. luciferum, P. normani, P. tenisoni* ; and from the stomach contents of *Dissostichus eleginoides* : *Gymnoscopelus nicholsi, G. piabilis, M. ventralis.* These results lend support to the vertical migratory feeding behaviour of *Champsocephalus gunnari* (Duhamel and Hureau, 1985), since the myctophids include both pelagic myctophids (*E. paucirastra, P. andriashevi, P. luciferum, P. normani, P. tenisoni) and those* possessing an epibenthic distribution during the day *(E. subaspera, M. ventralis, P. choriodon*) (Angelescu and Cousseau, 1969 ; Hulley, 1981) ; *Metelectrona ventralis* is known from daytime bottom trawls (WH 504/78 : 41° 25,5'S-59° 10,5'W ; 800-810 m ; WH 707/78 : 36°18,0'S-53°19,0"W ; 720 m ; G. Krefft, pers. comm.), while *Protomyctophum andriashevi* has been recorded only once from bottom trawling operations (WH 232/71), the single specimen (52,7 mm) probably representing contamination of the bottom sample as the net was heaved from depth (Hulley, 1981). On the other hand, the myctophids from the stomach contents of

Table VIII : *Krefftichthys anderssoni* : Females - distribution of stage of sexual maturity with standard length in Indian Sector specimens (RMT-8 : January - February 1985). Figures in parentheses refer to specimens from the Atlantic Sector (MT-1600 : November 1975-January 1976).

	SIZE CLASS (mm)										
	25	30	35	40	45	50	55	60	65	70	TOTAL
STAGE I	0 (2)	3 (9)	1 (10)	0 (5)	0 (1)	0 (0)	0 (0)	0 (0)	0 (0)		4 (27)
STAGE II	0 (0)	0 (0)	0 (0)	1 (1)	5 (6)	2 (0)	0 (1)	0 (0)	0 (0)		8 (8)
STAGE III	0 (0)	0 (0)	0 (0)	0 (0)	0 (3)	2 (8)	2 (6)	0 (4)	0 (0)		4 (21)
STAGE IV	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (5)	4 (13)	1 (10)	0 (4)		8 (32)
STAGE V	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (1)	1 (0)	0 (0)	0 (2)		1 (3)
STAGE VI	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (1)	0 (1)	0 (0)		0 (2)
TOTAL	0 (2)	3 (9)	1 (10)	1 (6)	5 (10)	7 (14)	7 (21)	1 (15)	0 (6)		25 (93)

Table IX : *Protomyctophum (Protomyctophum) bolini* : Females - distribution of stage of sexual maturity with standard length in Indian Sector specimens (RMT-8 : January 1985-February 1985). Figures in parentheses refer to specimens from the Atlantic Sector (MT-1600 : November 1975-January 1976).

	SIZE CLASS (mm)									TOTAL
	25	30	35	40	45	50	55	60	65	
STAGE I	0 (2)	1 (9)	2 (12)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		3 (23)
STAGE II	0 (0)	0 (0)	2 (0)	6 (13)	5 (15)	0 (8)	0 (3)	0 (0)		13 (39)
STAGE III	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	0 (11)	0 (11)	0 (0)		1 (26)
STAGE IV	0 (0)	0 (0)	0 (0)	0 (0)	1 (6)	1 (15)	0 (32)	0 (8)		2 (61)
STAGE V	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (3)	0 (1)	0 (0)		0 (4)
STAGE VI	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (1)	0 (0)	0 (0)		0 (1)
TOTAL	0 (2)	1 (9)	4 (12)	6 (13)	7 (25)	1 (38)	0 (47)	0 (8)		19 (154)

Dissostichus eleginoides are all known to have epibenthic day distributions (Hulley, 1981, 1986 b), suggesting predation confined to the epibenthic layer. Further, there appears to be a relation between the size of the prey species and that of the two predators. Lanternfishes from the stomach contents of the shelf/semi-pelagic species *Champsocephalus gunnari*, which attains a maximum total length of 45 cm in the Kerguelen region, range in size between 34 mm and 105 mm SL, while those from the stomach contents of the benthic species *Dissostichus eleginoides*, which attains a maximum total length of 215 cm around Kerguelen, range between 78 mm and 120 mm SL.

A total of 19 species of Myctophidae were represented in the material (Annexe I). While size-class structure of *Gymnoscopelus braueri*, *Krefftichthys anderssoni* and *Protomyctophum bolini* (Tables VI, VIII, IX) indicates that the RMT-8 captures smaller specimens than the MT-1600 net, there is an equivalence in size with maturity stage between specimens taken in the Atlantic sector (November-January) and specimens from the RMT-8 in the Indian sector (January-February). Further, meristic counts of all myctophid species from the Indian sector fall within the known ranges of specimens from the Atlantic sector (Table IV). Hulley (1981, 1986 a) has pointed out that the number of gill rakers on the lower limb of the first arch may exhibit clinal variation, while variation in the number on the upper limb of the first arch may be indicative of population structure or may be species-specific, when supported by differences in photophore grouping and/or caudal gland structure. Gill raker counts for the four most common species represented in our material are given in Table V. Statistical analyses of these data (Student's "t" - test) reveal that there are no significant differences in counts, except for the GR_1 value (t = 3,58 df = 253 p < 0,001) and consequently the GT_T value (t = 3,37 df = 253 p < 0,001) in *Protomyctophum bolini*. However, in this species the supracaudal luminous glands of male and the infracaudal luminous glands of female specimens form the Atlantic and Indian sectors are similar (*fide* Hulley, 1981 : fig. 10 B). These results therefore indicate that there is no evidence for population structuring in these lanternfish species, at least between the Atlantic and Indian sectors of their circumpolar distribution, although *P. bolini* may exhibit a degree of clinal variation.

The bathypelagic species, *Gymnoscopelus (Gymnoscopelus) opisthopterus* was taken once at Station 22'- 078, the only station fished with 1 500 m. w. o. (888-1002 m) or more during the cruise. The three specimens consisted of an immature female (82 mm) and two males (69-121 mm). Forty-nine specimens (81-128 mm), taken at Station 03-04 (66° 26'S-62° 04'E; ± 500 m) during the R.V. Africana SIBEX-II cruise in March 1985 have also been examined. All female specimens were immature (Stages I, II). Female specimens taken during November 1975-January 1976 by the R.V. *Walter Herwig* in the Atlantic sector were mainly immature (87-158 mm), although some larger specimens (142-157 mm) possessed developing and mature ovaries.

Electrona antarctica was the most frequently encountered species during the MD-42/SIBEX-II cruise. Its distribution at these stations is given in Figure 2. Hulley (1981, in press) has pointed out that the species possesses an Antarctic distribution pattern because, while it may be found as far north as the STC, it spawns only in the region of and south of the APF. As in the Atlantic sector, sexual dimorphism in MD-42 specimens was marked (males : 76 mm maximum SL; females : 94 mm maximum SL) and the length-frequency distribution has three peaks for females (30-40 mm, 50-54 mm, 65-80 mm) (Table VI) and two peaks for males (25-30 mm, 60-64 mm). These approximate the values for specimens from RMT-8 samples in the Atlantic sector (Rowedder, 1979), namely : 32,5 mm, 57,5 mm and 92,5 mm (females) and 37,5 mm and 77,5 mm (males).

Rowedder (1979) has suggested that in the Atlantic sector, the species attains an age of three years, with Year-1 specimens represented by the 32,5-47,5 mm size classes ; Year-2 by the 57,5-62,5 mm size classes; and Year-3 by the 87,5-92,5 mm size classes. Analysis of the sexual stages of females from the Indian sector would support this, with Year-1 being represented by Stage I females (20-40 mm) ; Year-2 by Stage I and II females (45-60 mm) ; and Year-3 by Stages II, III, IV and V females (65-90 mm) (Table VI). However, otolith material from 112 specimens from cruise MD-42 suggests that the fishes may range from "one to five (possibly six) years of age" (N. Klages, pers. comm.).

Further, the presence of both opaque and hyaline centres suggest an extended spawning season (N. Klages, pers. comm.). The ratio of immature females : mature females (1:5) and the presence of both larvae (207 specimens) and sexually mature females in the RMT-8 catches support the concept of batch-spawning, with a peak in autumn-winter (Hulley, in press). The larval specimens were taken over the ridge system and throughout the grid, from south of Kerguelen to about 66° S, but were generally absent at those stations where bottom depths were shallower than 500 m e.g. Heard Island shelf, Banzare Bank, Prydz Bay slope (Fig. 2). The absence of larvae from the nine Bongo stations, which were occupied within the 500 m isobath to the south and north-east of Kerguelen at the end of cruise MD-42 confirms this depth-distributional limit for the species (Camus, in prep.).

The occurrence of *Bathylagus antarcticus* during cruise MD-42/SIBEX-II is given in Figure 3. The species, which attains a maximum length of 150 mm or more, has a broadly Antarctic distribution pattern, being recorded both north and south of the APF (Cohen, 1986). Our data indicate that the species was only taken in hauls fished deeper than 470 m. Similarly, data from the South African SIBEX-II cruise indicate a bathypelagic distribution : the species was present in the deep haul (Station 03-04 : ca. 500 m) at 66° 26'S-62° 04'E, but was absent from the shallow haul (Station 03-03 : 55 m) at 66° 23'S-61° 59'E (Miller, 1986). *Bathylagus antarcticus* was not recorded during the Australian FIBEX cruise, where depths sampled with the RMT-8 net varied between 10-127 m and those sampled by Bongo varied between 0-480 m (Williams *et al.*, 1983). However, 17 specimens from Haul 080 (930-980 m) and 91 specimens from Haul 125 (930-980 m) identified only as "fish bathypelagic" may include this species. Hulley (1972) has recorded the species

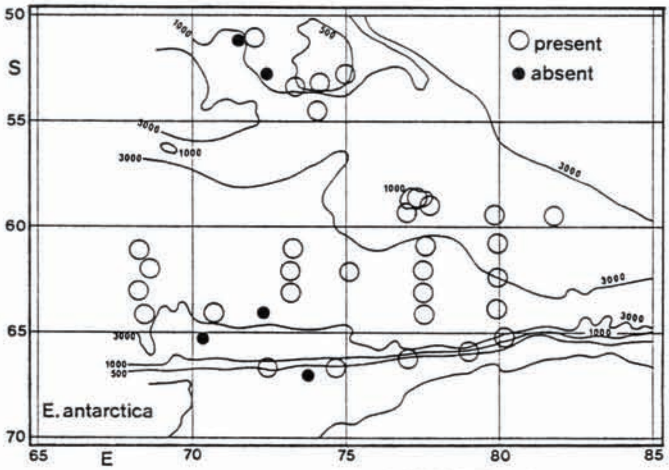
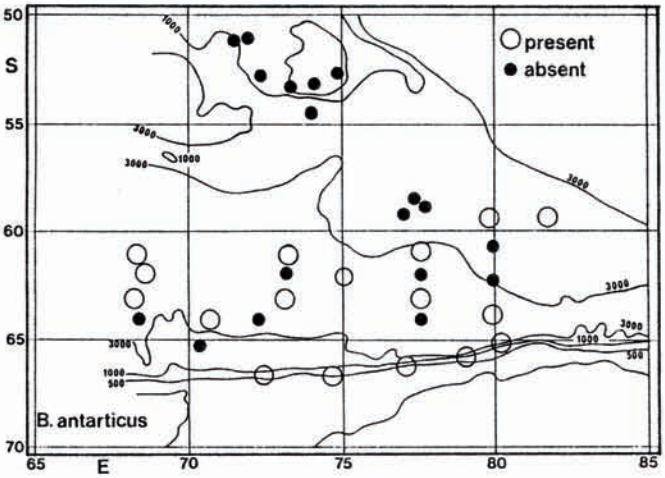


Fig. 2 : Distribution of *Electrona antarctica* at MD-42/SIBEX-II stations.



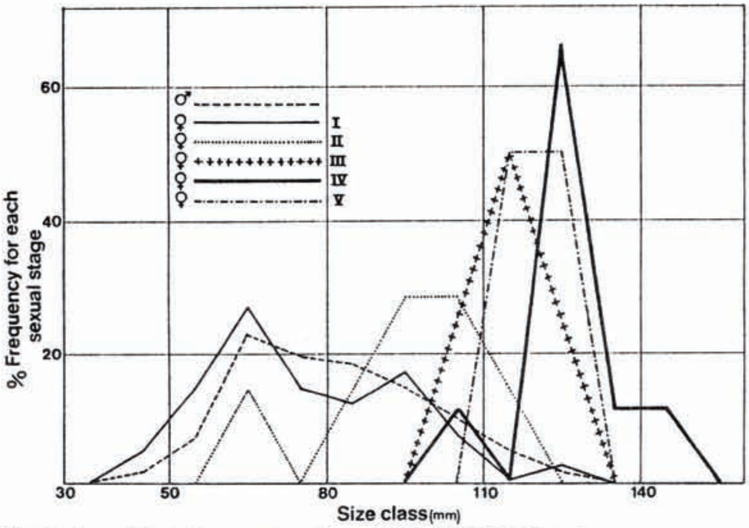
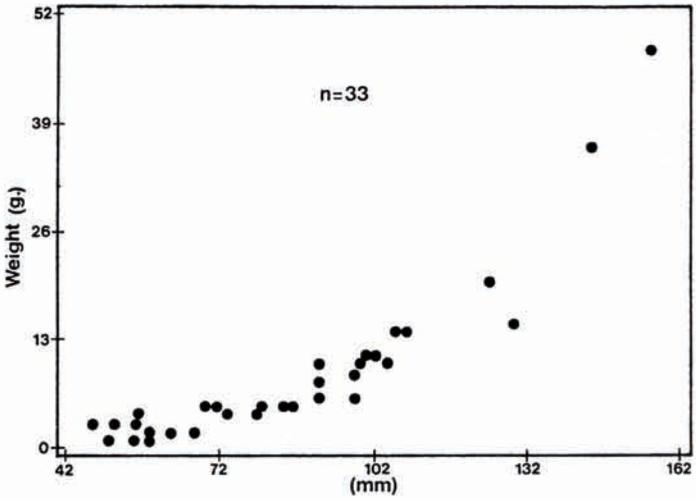


Fig. 3 : Distribution of *Bathylagus antarcticus* at MD-42/SIBEX-II stations.
Fig. 4 : Sex and sexual stages (females) of *Bathylagus antarcticus* specimens from MD-42/SIBEX-II.

from as far north as 20° 30'S-10° 03'E and at depths between 600-1400 m. Although Gon (1987 : 9) has suggested that *B. antarcticus* specimens have been caught "between the surface and about 4000 m", examination of his records has revealed that only in a single case (RUSI 22841 : 1 (107,3 mm) ; 62° 01,7'S-57° 57,7'E; Bongo ; 0-250 m) was the maximum fishing depth less than 500 m. It should be noted that eight *Bathylagus* larvae were taken in six Bongo hauls, fished to a maximum depths between 180 m and 250 m, during the MD-42 cruise (Camus, in prep.).

There is little evidence of sexual dimorphism in size in the data (Fig. 4). For females, three distinctive peaks, in length-frequency can be recognized : 60-70 mm (Stages I, II) ; 90-100 mm (Stages I, II) and 100-130 mm (Stages III, IV,V). Female specimens are sexually mature from about 113 mm, at which length they weigh about 13 g (Fig. 5).



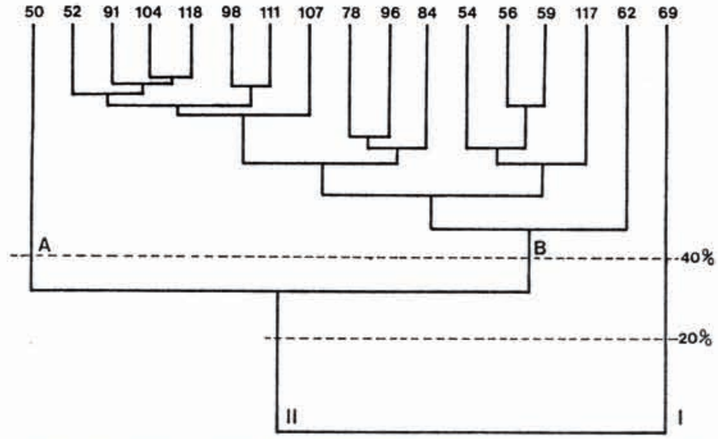


Fig. 5 : Scatter plot of standard length (SL) vs wet weight for *Bathylagus antarcticus*.

Fig. 6 : Dendrogram for station affinities for RMT-8 ichthyological hauls of southern grid system.

On the basis of both the dendrogram and MDS ordination (Figs 6, 7), Station 22' - 069 (Group I) appears to be well separated (similarity 1,00 %) from the rest of the stations (Group II) of the southern grid. The Group I station was fished over the continental slope region (bottom depth 470 m) of the Prydz Bay region, presumably within the band of westerly flowing Continental Water (Miller, 1987), while the Group II stations were situated over depths between 875 m and 4290 m. Only two taxa were taken at the Group I station, namely Artedidraconidae and *Pleuragramma antarcticum*. The former taxon was also found at the adjacent station (Station 22-062), but adult *Pleuragramma antarcticum* were not taken at any other station in the RMT-8 ichthyological grid. Larval specimens of this species were fished with the RMT-8 at two krill grid stations, 23-083 (238 m.w.o. (= 160-204 m) ; 20 mm) and 23A-085 (78 m.w.o. ; 19 mm), suggesting the possibility of a northerly drift between about 65°E and 75°E, as proposed by Smith *et al.* (1984 : fig. 10). Only a

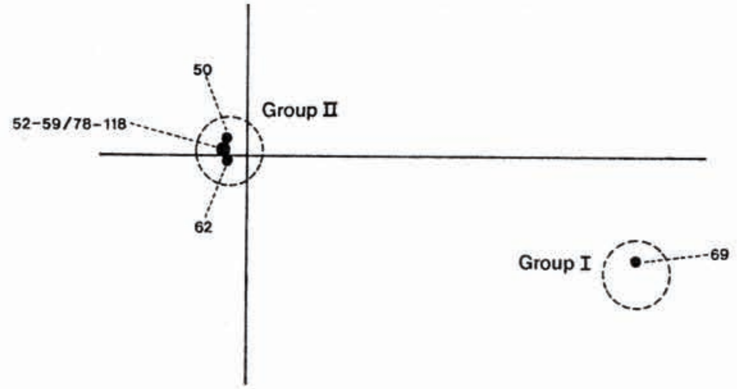


Fig. 7 : MDS ordination of ichthyological RMT-8 station affinities for southern grid system.

single larval specimen of this species was taken in the Bongo stations occupied during cruise MD-42 (65° 03'S 80° 03'E).

As with the Group I station, the clustering of the Group II stations can best be correlated with fishing depth (Fig. 6), since the standardisation procedure was followed only at Station 22'-078 and Subgroup B stations encompass hauls fished during the "day" (06h00-18h00) and at "night" (18h00-06h00). The single Subgroup A station (17-050) was the only station in Group II with a fishing depth of less than 500 m ; Subgroup B fishing depths varied between 750 m and 1500 m. However, examination of the MDS ordination reveals the close proximity of all stations except 22'-069, and would point to the absence of zonal distribution patterns at least over the region covered by the ichthyological grid.

To summarise, the results indicate that the myctophid species assemblages (Hulley, 1981) of the Indian and Atlantic sectors of the Southern Ocean are similar and that there is no evidence of population structuring within the two sectors. However, some degree of clinal variation may exist, e.g. *Protomyctophum bolini*. There is also no evidence of zonal distribution patterns in species found south of the APF, although meridional spread of epipelagic East Wind Drift species *(Pleuragramma antarcticum*) may occur between 65°-75°E in association with northerly transport in this region (Miller, 1987). Oceanic mesopelagic and bathypelagic species are generally absent inside the continental shelf break at Prydz Bay and over the Kerguelen-Gaussberg ridge system.

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Annexe I : Species composition of RMT-8 samples taken during MD-42 (SIBEX-II), including data on additional specimens of Myctophidae from sampling cruises in the Indian Sector of the Southern Ocean. Standard lengths (in mm) are given in parentheses ; * - Atlantic Sector Stations ; St. - Station.

Family artedidraconidae

MD-42 : St. 22-062 : 2 (15-18) ; St. 22'-069 : 2 (15-16).

Family Bathydraconidae

Bathydraco antarcticus Günther, 1887. MD-42 : St. 05-028 : 1(30) ; St. 10-034 : 1 (44) ; St. 11-038 : 1 (47) ; St. 12-039 : 2 (49-51) ; St. 15-044 : 2 (34-36) ; St. 17-050 : 1 (33).

Bathydraco sp. MD-42 : St. 22-062 : 1 (29) ; St. 22C-080 : 3 (39-46).

Racovitzia sp. MD-42 : St. 23A-085 : 1 (43).

Family Bathylagidae

Bathylagus antarcticus Günther, 1878. MD-42 : St. 13-043 20 (31-128); St. 15-044 : 1 (34) ; St. 18-052 : 21 (41-127) ; St. 19-054 : 3 (35-68) ; St. 20-056 : 2 (21-26) ; St. 21-059 : 5 (31-64) ; Sation 22-062 : 35 (29-122) ; St. 22'-078 : 29 (29-98) ; St. 23A-084 : 10 (29-149) ; St. 26-091 : 10 (18-83+) ; St. 27-096 : 18 (25-113) ; St. 28-098 : 12 (21-109) ; St. 29-104 : 22 (31-113) ; St. 30A-107 : 9 (27-113+) ; St. 32-111 : 4 (34-121+) ; St. 33-117 : 5 (84-106+) ; St. 34-118 : 15 (33-98).

MD-42 (beam trawl) : St. 13-041 : 2 (124 (2)).

Family Channichthyidae

Chaenichthys rhinoceratus Richardson, 1844. MD-42 : St. 03-016 : 1 (46) ; St. 04-022 : 1 (73) ; St. 05-028 : 1 (30).

Champsocephalus gunnari Lönnberg, 1905. MD-42 : St. 05-028 : 1 (23).

Neopagetopsis ionah Nybelin, 1947. MD-42 : St. 22-062 : 1 (290).

Family Gonostomadidae

Cyclothone sp. MD-42 : St. 01-006 : 1 (36) ; St. 06-033 : 2 (31 (2)); St. 13-043 : 2 (47 + 1 not measured) ; St. 15-044 : 2 (33-38) ; St. 16-048 : 1 (33) ; St. 18-052 : 3 (38-41) ; &St. 19-054 : 2 (30-33) ; St. 22'-078 : 3 (33-39) ; St. 23A-084 : 6 (32-42) ; St. 26-091 : 5 (30-38) ; St. 27-096 : 9 (33-43 + 1 not measured) ; St. 28-098: 7 (25-57) ; St. 29-104 : 7 (26-42) ; St. 30A-107 : 2 (36-39) ; St. 32-111 : 5 (37-40 + 1 not measured) ; St. 32-112 : 1 (30) ; St. 34-118 : 7 (31-44).

MD-42 : (beam trawl) : St. 13-041 : 2 (54-57).

Family Macrouridae

Macrourus holotrachys Günther, 1878. MD-42 : St. 01-006 : 1 (26).

Macrourus sp. MD-42 : St. 10-034 : 1 (13).

Family Melanonidae

Melanonus gracilis Günther, 1878. MD-42 : St. 18-052 : 1 (130) ; St. 26-091 : 1 (125) ; St. 29-104 : 1 (106+) ; St. 34-118 : 2 (131-144).

Family Muraenolepidae

Muraenolepis ? microps Lönnberg, 1905. MD-42 : St. 22-062 : 1 (13) ; St. 23- 082 : 1(19).

Family Myctophidae

Electrona antarctica (Günther, 1878). MD-42 : St. 01-006 : 1 (11) ; St. 03-019 : 7 (21-39) ; St. 04-022 : 4 (26-43) ; St. 05-028 : 4 (13-14) ; St. 06-033 : 39 (8-63) ; St. 10-034 : 1 (28) ; St. 11-038 : 11 (16-59) : St. 12-039 : 8 (9-16) ; St. 13-043 : 27 (13-94) : St. 15-044 : 39 (11-83) ; St. 16-048 : 2 (13-16) ; St. 17-050 : 3 (15-89) ; St. 18-052 : 13 (15-89) ; St. 19-054 : 2 (16-25) ; St. 20-056 : 9 (11-62) ; St. 21-059 : 15 (16-83) ; St. 22-062 : 55 (22-82) ; St. 22'-078 : 74 (21-82) ; St. 23-082 : 1 (11) : St. 23-083 : 4 (11-18) ; St. 23A-084 : 14 (11-57) ; St. 25-088 : 9 (13-18) ; St. 25-089 : 9 (12-18) ; St. 26-091 : 19 (10-76) ; St. 26-092 : 2 (16-17) ; St. 27-095 : 9 (23-67) ; St. 27-096 : 29 (7-68) ; St. 28-098 :

21 (8-52) ; St. 28-099 : 52 (7-77) ; St. 28-100 : 9 (28-51) ; St. 29-103 : 4 (23-75) ; St. 29-104 : 26 (7-70) ; St. 30-105 : 6 (9-16) ; St. 30-106 : 3 (14-16) ; St. 30A-107 : 10 (9-65) ; St. 31-109 : 15 (7-86) ; St. 32-110 : 16 (25-71) ; St. 32-111 : 18 (11-86) ; St. 32-112 : 3 (27-33) ; St. 33-115 : 1 (64) ; St. 33-116 : 5 (33-59) ; St. 33-117 : 3 (26-76) ; St. 34-118 : 13 (12-68).

MD-42 : (beam trawl) : St. 06-032 : 2 (43-57) ; St. 13-041 : 2 (76-85) ; St. 22-070 : 12 (51-71).

MD-03 : St. 01-01 : 7 (47-75) ; St. 11-31 : 1 (34) ; St. 12-34 : 1 (43); St. 13-41 : 1 (42) ; St. 17-50 : 1 (55).

MD-24 : *St. 07-12 : 1 (78) ; *St. 08-13 (74-98).

MD-25 : St. 23-111 : 1 ; St. 23-112 : 10 ; St. 13-066 : 3 ; St. 05-021 : 1 ; St. 09-045 : 1 ; St. 09-044 : 2 ; St. 19-091 : 6 ; St. 23-110 : 1 ; St. 12-060 : 2 ; St. 05-023 : 17 ; St. 03-017 : 20 ; St. 07-034 : 1 ; St. 15-075 : 8.

Electrona carlsbergi (Tåning, 1932). MD-42 : St. 02-007 : 1 (88) ; St. 13-043 : 1 (85)

MD-03 : St. 03-08 : 1 (84).

Oceano/Austral/83 : St. 15 : 1 (103).

Electrona paucirastra Bolin *in* Andriashev, 1962. 'ALSU' St. 258 : 1 (59) (stomach of *C. gunnari)*.

Electrona subaspera (Günther, 1864). 'AUSTRAL' : St. 20 : 1 (105) (stomach of *C. gunnari)* ; St. 91 : 1 (102).

Oceano/Austral/83 : St. 102 : 1 (99) (stomach of *C. gunnari)* ; St. 117 : 1 (66) (stomach of *C. gunnari)*.

Electrona sp. MD-42 : St. 06-033 : 4 (7-12) ; St. 10-034 : 1 (16) ; St. 15-044 : 2 (16 + 1 not measured) ; St. 21-059 : 1 (7) ; St. 23-083 : 2 (11-12) ; St. 25-088 : 2 (11 + 1 not measured) ; St. 28-099 : 3 (8-15) ; St. 30A-107 : 1(6) ; St. 32-111 : 3 (8-11) ; St. 34-18 : 1 (15).

Gymnoscopelus (Gymnoscopelus) bolini Andriashev, 1962. MD-04 : St. 106-258 : 1 (193).

Gymnoscopelus (Gymnoscopelus) braueri (Lönnberg, 1905). MD-42 : St. 04-022 : 2 (96-103) ; St. 06-033 : 4 (57-84) ; St. 11-038 : 5 (62-93) ; St. 22-062 : 2 (68-96) ; St. 23A-084 : 1 (89) ; St. 26-091 : 2 (65-69) ; St. 27-095 : 1 (72) ; St. 28-098 : 4 (72-115) ; St. 28-100 : 1 (71) ; St. 29-104 : 6 (76-115) ; St. 30A-107 : 2 (63-64) ; St. 32-111 : 6 (57-84) ; St. 34-118 : 1 (57).

MD-03 : St. 03-08 : 1 (69) ; St. 13-42 : 2 (107-123).

MD-24 : *St. 08-13 : 3 (83-117).

MD-30 : St. 54-180 : 1 (124).

'POLTAVA' St. 512 : 5 (71-104).

Gymnoscopelus (Gymnoscopelus) nicholsi (Gilbert, 1911). MD-42 : St. 23A-084 : 1 (128).

Oceano/Austral/83 : St. 8 : 1 (69) ; St. 15 : 2 (88-116).

MD-30 : St. 42-128 : 1 (not measured).

ICHTHYO : St. 79/80 : 9 (95-124).

MD-25 : St. 05-022 : 1 ; St. 03-017 : 1.

Oceano/Austral/83 : St. 35 : 18 (96-129) ; St. 80 : 35 (105-114) (stomach of D. *eleginoides*) ; St. 121 : 2 (112-123).

'VZMORIE' St. 184 : 5 (93-131).

'MYSOS' St. 191 : 5 (62-90).

Gymnoscopelus (Gymnoscopelus) ? nicholsi (Gilbert, 1911). MD-08 : St. 69-276 : 1 (42).

Gymnoscopelus (Gymnoscopelus) opisthopterus Fraser-Brunner, 1949. MD-42 : St. 22'-078 : 3 (69-121).

Gymnoscopelus (Nasolychnus) fraseri (Fraser-Brunner, 1949). MD-24 : St. 35-51 : 1 (81).

Gymnoscopelus (Nasolychnus) piabilis (Whitley, 1931). Oceano/Austral/83 : St. 102 : 7 (102-120) ; St. 15 : 2 (119-134) ; St. 91 : 1 (120) (stomach of *Dissostichus eleginoides)*.

Krefftichthys anderssoni (Lönnberg, 1905). MD-42 : St. 01-006 : 2 (14-15) ; St. 03-016 : 1 (59) ; St. 03-019 : 4 (11-14) ; St. 04-022 ; 11 (12-54) : St. 05-028 : 2 (11 (2)) ; St. 06-033 : 9 (9-58) ; St. 13-043 : 1 (58) ; St. 18-052 : 3 (44-53) ; St. 25-088 : 1 (56) ; St. 25-090 : 1 (50) ; St. 26-091 : 12 (44-62) ; St. 28-098 : 4 (45-52) ; St. 29-104 : 3 (43-52) ; St. 30A-107 : 5 (33-57) ; St. 31-109 : 6 (49-57) ; St. 34-118 : 6 (28-57).

MD-03 : St. 08-08 : 1 (40).

MD-08 : St. 69-276 : 2 (59-60).

MD-24 : *St. 07-12 : 2 (49-54).

MD-30 : St. 52-74 : 1 (22) ; St. 54-180 : 1 (54).

Crozet : Ile Possession : 1 (37).

Lampanyctus achirus Andriashev, 1962. MD-42 (beam trawl) : St. 02-009 : 1 (110+).

Metelectrona ventralis (Bekker, 1963). 'AUSTRAL' : St. 20 : 3 (76-92) (stomach of *C. gunnari*).

'ALSU" St. 258 : 1 (73) (stomach of *C. gunnari*).

Oceano/Austral/83 : St. 80 : 1 (80) (stomach of *D. eleginoides*) ; St. 91 : 4 (67-85) ; St. 102 : 3 (62-76) (stomach of *C. gunnari*) ; St. 112 : 1 (78) (stomach of *D. eleginoides*).

Protomyctophum (*Protomyctophum*) *andriashevi* Bekker, 1963. 'AUSTRAL" : St. 20 : 1 (50) (stomach of *C. gunnari*).

MD-03 : St. 03-08 : 1 (46).

MD-08 : St. 08-276 : 1 (42).

Protomyctophum (*Protomyctophum*) *bolini* (Fraser-Brunner, 1949). MD-42 : St. 02-007 : 4 (34-56) ; St. 03-019 : 1 (52) ; St. 04-022 : 2 (49-55) ; St. 06-033 : 2 (48-50) ; St. 11-038 : 1 (43) ; St. 18-052 : 1 (39) ; St. 20-056 : 1 (39) ; St. 26-091 : 1 (39) ; St. 27-096 : 2 (43-45) ; St. 28-098 : 4 (38-45) ; St. 29-104 : 3 (38-42) ; St. 30A-107 : 1 (36) ; St. 32-111 : 3 (40-47) ; St. 33-117 : 1 (46) ; St. 34-118 : 2 (40-46).

MD-42 (beam trawl) : St. 01-004 : 1 (42).

MD-03 : St. 03-08 : 14 (33-38).

MD-08 : St. 08-276 : 1 (49).

MD-24 : *St. 08-13 : 1 (53).

Protomyctophum (Protomyctophum) choriodon Hulley, 1981. MD-42 (beam trawl) : St. 06-032 : 1 (63).

Oceano/Austral/83 : St. 102 : 1 (81) (stomach of *C.gunnari*).

Protomyctophum (Protomyctophum) luciferum Hulley, 1981. 'AUSTRAL' : St. 20 : 1 (68) (stomach of *C. gunnari*).

'MYSOS' : St. 191 : 1 (57).

Protomyctophum (Protomyctophum) normani (Tåning, 1932). Oceano/Austral/83 : St. ? : 1 (37) (stomach of *C. gunnari*).

Protomyctophum (*Protomyctophum*) *tenisoni* (Norman, 1930). 'AUSTRAL' : St. 20 : 1 (34) (stomach of *C. gunnari*).

MD-03 : St. 03-08 : 1 (38).

Protomyctophum (*Protomyctophum*) sp. 'AUSTRAL' : St. 20 : 1 (61) (stomach of *C. gunnari*).

MD-08 : St. 69-276 : 1 (53).

'GUEROT' St. 296 : Fichen No. 50 : 1 (58).

Myctophidae *indet.*. MD-03 : St. 01-01 : 2 (33-37) ; St. 03-08 : 3 (36-37) ; St. 13-41 : 2 (52-55) ; St. 17-50 : 1 (41).

MD-O8 : St. 69-276 : 15 (56-83).

Family Nototheniidae

Notothenia mizops (Günther, 1880). MD-42 : St. 01-006 : 19 (30-35).

Notothenia sp 1. MD-42 : St. 03-016 : 1 (21).

Notothenia sp 2. MD-42 : St. 05-028 : 1 (23).

Pleuragramma antarcticum Boulenger, 1902. MD-42 : St. 22' - 069 : 4 (102-122) ; St. 23-083 : 1 (20) ; St. 23A-085 : 1 (19).

Trematomus sp 1. MD-42 : St. 21-060 : 1 (29) ; St. 22-063 : 1 (32) ; St. 23-082 : 1 (28).

Family Paralepididae

Notolepis coatsi Dollo, 1908. MD-42 : St. 01-006 : 1 (65) ; St. 03-019 : 1 (62) ; St. 04-022 : 10 (57-66) ; St. 06-033 : 5 (63-147) ; St. 11-038 : 1 (35) ; St. 13-043 : 6 (40-72) ; St. 15-044 : 4 (31-63) ; St. 16-048 : 1 (53) ; St. 17-050 : 1 (39) ; St. 18-052 : 10 (46-134) ; St. 19-054 : 9 (34-65) ; St. 20-056 : 18 (35-65) ; St. 21-059 : 17 (30-74) ; St. 22-062 : 8 (32-71) ; St. 22'-078 : 6 (24-32) ; St. 22C-80 : 1 (71) : St. 23A-084 : 13 (29-73) ; St. 23A-085 : 2 (75-144) ; St. 26-091 : 18 (27-76) ; St. 26-092 : 1 (33) ; St. 27-094 : 1 (167) ; St. 27-096 : 16 (19-62) ; St. 28-098 : 9 (32-73) ; St. 28-099 : 5 (24-36) ; St. 29-102 : 1 (104) ; st. 29-104 : 8 (33-76) ; St. 30-105 : 2 (18-36) ; St. 30A-107 : 5 (27-65) ; St. 31-109 ; 2 (19-23) ; St. 32-111 : 8 (23-65) ; St. 33-117 : 2 (66-68) ; St. 34-118 : 7 (64-77).

MD-42 (beam trawl) : St. 13-041 : 1 (61).

Family Scopelarchidae

Benthalbella elongata (Norman, 1937). MD-42 : St. 32-111 : 1 (186).

Benthalbella macropinna Bussing & Bussing, 1966. MD-42 : St. 30A-107 : 1 (144) ; St. 33-117 : 1 (180).

Family *indet.*

MD-42 : St. 30-105 : 1 .